CHAPTER 2: PURPOSE OF AND NEED FOR U.S. DEPARTMENT OF ENERGY ACTION

2.1 PURPOSE AND NEED

The end of the Cold War resulted in the curtailment of new nuclear weapons design and production programs, a significant reduction in funding for maintaining the nuclear weapons stockpile, and the adoption of a comprehensive ban on nuclear testing. Y-12, the oldest of the Nation's nuclear weapons production facilities, now faces significant and diverse new challenges in its national security mission.

As discussed in Section 1.1.1, DOE has prepared several PEISs to determine how best to carry out its national security requirements in the post-Cold War era. Based on those PEISs, DOE has made a number of programmatic decisions related to the long-term storage and disposition of fissile material, the maintenance of national security missions, and assurance of the safety and reliability of the nuclear weapons stockpile. Based on DOE's programmatic decisions, Y-12 will continue to play an integral role in the continuance of DOE's programs supporting the Nation's nuclear defense. The purpose of DOE's proposed action is to implement the programmatic decision previously announced in the RODs for the SSM PEIS and the S&D PEIS.

During the Cold War, new weapons programs provided capital investment in the DOE weapons production plants, supporting development of new technologies and construction of new and updated facilities. The end of the Cold War, together with a shrinking defense budget, halted the regular infusion of capital and technology into the weapons production plants. This situation has resulted in an 80 percent reduction in annual capital investments at the Y-12 Site and significantly increased Y-12's maintenance backlog. Today, Y-12 is using 1980s or older processes and technologies to perform its missions. The situation at Y-12 is one in which DOE is faced with the following choices: continue to pursue expensive stop-gap repair operations or invest sufficient capital in Y-12 to modernize technologies and facilities.

The primary purpose of this SWEIS is to document a baseline for Y-12 Site mission operations and to evaluate the reasonable alternatives for implementing the programmatic decisions previously announced in the RODs for the SSM PEIS and the S&D PEIS. In those PEIS RODs, DOE determined that the missions identified in Section 1.1.4 will remain at Y-12. DOE has also determined that the existing Y-12 facilities are old, over-sized, inefficient, not cost-effective, and do not maximize the attainment of environment, safety and health (ES&H) goals. Consequently, this SWEIS evaluates reasonable alternatives for modernizing the HEU Storage Mission and Special Materials Mission at Y-12 to maximize efficiency, cost-effectiveness, and ES&H goals.

The purpose and need for the proposed HEU Storage Facility and the proposed Special Materials Complex are presented below.

HEU Storage Mission. The purpose of DOE's proposed action is to consolidate and modernize the HEU storage operations at Y-12 in accordance with the S&D PEIS ROD. By consolidating HEU in a new modern facility, Y-12 would be able to meet its HEU storage mission in a more safe and efficient manner; improve nuclear materials security and accountability; and enhance worker, public, and environmental safety. DOE's action is needed because existing HEU storage facilities at Y-12 are in buildings that already are 35 to 55 years old and require significant maintenance and funding to maintain operations and security protocol. In addition, some of the buildings in which storage facilities are located do not meet current standards for natural phenomenon events (e.g., tornado and seismic occurrences).

Special Materials Mission. The purpose of DOE's proposed action is to modernize special materials operations to meet projected nuclear weapons stockpile requirements in accordance with the SSM PEIS ROD and meet more protective beryllium exposure limits for workers. The action is needed because the existing processes and facilities at Y-12 needed to support production of special materials have deteriorated to the point that DOE can no longer be assured of their operational reliability. In addition, DOE must meet more stringent American Conference of Governmental Industrial Hygienists (ACGIH) exposure limits for suspended beryllium in air (0.2 Fg/m^3). The new exposure limits cannot be met using existing Y-12 facilities without excessive administrative controls and personal protective equipment which would reduce production efficiencies and jeopardize meeting nuclear weapons stockpile mission support requirements. DOE's action would ensure efficient production of adequate quantities of special materials for all anticipated scenarios considered in the nuclear weapons stockpile for the next 50 years and reduce the health risk to workers and the public.

2.2 U.S. DEPARTMENT OF ENERGY PROGRAM ACTIVITIES PERFORMED AT THE Y-12 SITE

The following sections summarize the activities performed under the various ongoing DOE programs at the Y-12 Site. Applicable to all Y-12 missions is the Safeguards and Security Program. The Protective Services Organization provides policy oversight in the areas of safeguards and security, nuclear materials control and accountability, classification, and technical information for BWXT Y-12. The Protective Services Organization is an integrated organization implementing requirements in a consistent manner at Y-12 in conjunction with Security Forces managed by Wackenhut, Inc. The Protective Services Organization is responsible for ensuring the adequate protection of National Security Information through proper identification and control of corporate assets entrusted to BWXT Y-12. The following describes the DP missions and other DOE missions at Y-12, which may be influenced by proposed actions.

2.2.1 Defense Programs

The DP activities performed at Y-12 include maintaining the capability to produce secondaries and radiation cases for nuclear weapons, storing and processing uranium and lithium materials and parts, dismantling nuclear weapons secondaries returned from the stockpile, and providing special production support to DOE weapons laboratories and to other DOE programs. To accomplish the storage mission, some processing of special nuclear materials may be required to recover materials from returned secondaries. In addition, Y-12 performs stockpile surveillance activities on the components it produces.

The Weapons Stockpile Management Program structure at Y-12 includes:

- Core Stockpile Management
  - Nuclear Materials Management and Storage
  - Quality Evaluation and Surveillance
  - Weapons Dismantlement and Disposal
  - Stockpile Evaluation and Maintenance
  - Materials Recycle and Recovery
  - Modernization and Facility Transition
  - Enriched Uranium Operations
  - Nuclear Packaging Systems
  - Advanced Design and Production Technologies
  - Manufacturing Processes Program
  - Facility Program
  - Capital Program

- Materials Surveillance
- Y-12 Mission Support

A summary of each of the Core Stockpile Management Program components, the Materials Surveillance Program, and Y-12 Mission Support is provided in the following discussion.

Core Stockpile Management. The Core Stockpile Management operations at the Y-12 National Security Complex include the principal activities in support of nuclear weapons stockpile management. These missions are structured into 12 major component programs.

Nuclear Materials Management and Storage. The Nuclear Materials Management and Storage Program includes multi-disciplinary initiatives in numerous facilities throughout Y-12. The program activities include (1) planning, designing, providing, and maintaining storage facilities and storage operations for the safe and secure storage of nuclear materials; (2) multi-year program planning to ensure nuclear weapons components and materials throughout the DOE Nuclear Weapons Complex are returned to Y-12 and prepared for interim or long-term storage; (3) nuclear materials planning, forecasting, and scheduling as a part of the Storage Program and as the integrator for multiple programs utilizing nuclear materials, such as Dismantlement, Stockpile Maintenance, Fissile Materials Disposition, Nuclear Nonproliferation and National Security, and Work-for-Others; (4) supporting development, design, and implementation of innovative and cost-saving technologies for storage, monitoring, and measurement of nuclear materials while reducing risks; (5) developing and maintaining technical standards for the storage of HEU, lithium, and canned subassemblies; (6) providing safeguards and security for Core Stockpile Management nuclear materials and facilities; (7) developing and implementing projects to disposition, monitor and maintain HEU in safe, optimum storage; and (8) providing interim storage of DOE surplus low enriched uranium, natural uranium, or commercial uranium for use as blendstock.

Currently, the program supports six facility areas that store HEU in metal, oxide, or other compound forms. The program also supports several facility areas that store lithium, beryllium, depleted uranium, natural uranium, deuterium, and nonnuclear weapons components.

Quality Evaluation and Surveillance. The Quality Evaluation and Surveillance Program provides for the activities required to assess the integrity of the stockpile, including safety, reliability, design compatibility, and functionality of components over the life of each weapons system in the stockpile. Confidence in the safety and reliability of the Nation's nuclear weapons stockpile is acquired and sustained through a quality evaluation program beginning in early production and continuing throughout each weapon system's life to retirement. The condition of the stockpile is determined through a number of unique tests. Stockpile quality evaluation is supplemented by a surveillance program that includes testing and evaluating accelerated aging units, production core samples, and shelf-life units. These units and/or components never enter the stockpile, but provide additional baseline data that are used to judge a secondary's condition throughout its life in the stockpile.

Y-12 has the responsibility of the Quality Evaluation and Surveillance Program pertaining to the secondaries, case parts, shelf-life units, core samples, and other vital components. The Stockpile Stewardship Program consists of testing, sampling, disassembly, component testing, and collecting and evaluating data. The data and information obtained provide and establish the reliability of the weapon systems. Unique tests and data history provide the basis for a sound technical response for extending the stockpile life.

Weapons Dismantlement and Disposal. The Weapons Dismantlement and Disposal Program provides the activities required for the dismantlement of weapon systems that are retired from the nuclear stockpile. Components are returned to Y-12 as weapon systems directly from the military or from the Pantex Plant after

initial dismantlement. At Y-12, these components are stored in various storage facilities prior to further disassembly. Many of the disassembly processes required to separate and remove the various components have been implemented, while others are being developed or modified to enhance protection of personal health and safety or the environment. A variety of machine tools, hand tools, and specialty tools are used to machine, cut, press, or break the components apart. All components are tracked through the storage and processing steps to ensure that no special nuclear material (SNM) is diverted and that no classified information is compromised. The nuclear and special materials are sent to the appropriate processing steps for material recycle; the remainder of the components are modified by melting and recasting, pyrolysis, or chemically altering the material to remove classified features of the components and to render them unusable.

Stockpile Evaluation and Maintenance. The Stockpile Evaluation and Maintenance Program includes activities directed at continuing the fitness of nuclear weapon warheads in the enduring stockpile and producing weapon-related hardware to support DOE and U.S. Department of Defense (DoD) requirements.

The activities include all direct and indirect production efforts to provide Joint Test Assemblies and components for testing stockpile representative hardware. Also included are direct and indirect production efforts to maintain weapons in the enduring stockpile, such as modifications and Limited Life Component Exchange hardware.

Materials Recycle and Recovery. The Materials Recycle and Recovery Program supports the recovery of HEU and lithium from parts recovered from retired weapons programs and quality evaluation weapons teardowns, residue materials from manufacturing processes, lightly irradiated enriched uranium from other DOE sites or commercial and private facilities throughout the country, and wastes containing HEU generated from operations throughout Y-12. The program is responsible for receipt, accountability, processing to a storable form, and interim storage of enriched uranium and lithium.

Modernization and Facility Transition. The Modernization and Facility Transition Program supports the definition, development, and execution of activities required to support the missions and directives of the DOE at Y-12. Support of these missions and directives includes the following activities:

- Planning and execution of the Modernization Program, including site layout studies, technology assessments, facility sizing analysis, and other considerations

- Planning and execution of projects related to the consolidation of operations to reduce the DP existing operations facility footprint under the Stockpile Management Restructuring Initiative

- Planning and execution of activities to safely and compliantly shut down and subsequently manage surplus DP facilities

Enriched Uranium Operations. This program includes the activities directly associated with the resumption of Enriched Uranium Operations and related support at Y-12 for production of nuclear weapons components or other hardware that satisfies national priority requirements. The program also produces uranium products for other DOE programs and DOE customers (e.g., research reactors). These activities include development of process descriptions, drawings, criticality safety requirements, procedures, and training associated with the required process lines.

Nuclear Packaging Systems. The Y-12 Nuclear Packaging Systems Program includes the activities required for safe, efficient, and economical packaging for transporting and storing general cargoes, radioactive materials, and other hazardous materials within and out of Y-12. The packaging program fully complies with DOE directives and Federal, state, tribal, and international regulations, requirements, and standards. Key elements of the program include: (1) design, development, and testing methods; (2) preparation of Safety

Analysis Reports for packaging; (3) an extensive procurement base for packaging needs; (4) a tracking system for required maintenance, testing, and inspection to include mission oversight of fabrication, refurbishment, packing and unpacking, and decommissioning of packaging; and (5) a rigorous quality assurance program compliant with DOE and other applicable regulations and industry standards.

Advanced Design and Production Technologies. The Advanced Design and Production Technologies Program continues and accelerates the development and prototyping of advanced cost-effective and environmentally acceptable nuclear weapons production technologies and design processes required to maintain an affordable and reliable nuclear weapons stockpile. Many processes used in the DOE Nuclear Weapons Complex will be either improved or eliminated when new technologies are available. For Y-12, major program drivers will be the Stockpile Management Restructuring Initiative Plan and emerging DOE Advanced Design and Production Technologies goals, such as reducing refurbishment response time by 50 percent and exhibiting 10 times fewer defects than in the past in stockpile refurbishment hardware. The implemented technologies of the Advanced Design and Production Technologies Program will result in reduced operating costs, improved manufacturing flexibility, improved quality and reduced health, safety, and environmental impacts. The program's major elements include:

- Distributed Computer-Aided Design and Manufacturing
- Integrated Product and Process Design/Agile Manufacturing
- Enterprise Integration
- Hedge Strategies
- Process Development
- Material Research and Development

Manufacturing Processes Program. The Manufacturing Processes Program for Y-12 consists of multiple projects and tasks, all of which are focused on supporting the existing and future manufacturing footprint, processes, and production requirements. Some of these needs are developing, procuring, and implementing manufacturing information systems which support special nuclear material accountability regulations; implementing and enhancing weapon information management systems; implementing the transition plan for maintaining baseline technologies at Y-12; maintaining baseline key manufacturing processes; and providing physical site support in terms of pollution prevention and capital management.

Facility Program. The Facility Program manages 13 production facilities (and the facility systems) that are key to the Core Stockpile Management Program. The Facility Program includes activities required for continuous operations of each facility and also includes specific facility upgrade projects related to non-routine repairs, maintenance or alteration of the facility and facility systems, and ES&H compliance.

Capital Program. The Capital Program manages the capital investments being made to the Y-12 National Security Complex as either line-item projects, general plant projects, or general plant equipment activities. All major facility and process construction activities fall under this program.

Materials Surveillance. The Materials Surveillance Program operations involve handling, processing, storage, and accountability for weapons-grade and nonweapons-grade uranium.

The Uranium Central Scrap Management Office (CSMO) is responsible for making arrangements, including transfer of material, for recovery, storage, and disposition of uranium scrap from DOE sites. In addition to DOE sites, many U.S. colleges/universities and other government agencies possess DOE-owned nuclear materials obtained under DOE contractual or loan/lease agreements for research purposes. The CSMO is also responsible for managing the recovery, and storage and disposition (S&D) of uranium scrap derived from these sources.

The Materials Surveillance Program, through the DOE Business Center for Precious Metals Sales and Recovery, recovers DOE precious metals from contaminated and noncontaminated scrap and excess equipment, and makes this metal available to DOE and its prime contractors. The center has contracts with private refiners and pre-approved refiners for *Resource Conservation and Recovery Act* (RCRA) waste-contaminated, and radiological-contaminated precious metals. Precious metals excess to DOE programmatic needs may be sold on the open market; and proceeds are returned to the U.S. Treasury.

Y-12 Mission Support. The Y-12 Mission Support activities involve functions related to, but not directly assignable to, programs within the Y-12 Site that are necessary for Y-12 to meet its mission.

Mission Support includes those functions necessary to: (1) maintain a minimum capability of processes within the production and support organizations of the Y-12 National Security Complex; (2) ensure personnel are employed, trained, and equipped to perform their assigned jobs; (3) ensure operating and support organizations are managed; (4) and provide tasks that support Y-12 missions from a plant level (e.g., laundry, some utilities, and computer support).

2.2.2 Environmental Management Programs

The Environmental Management (EM) activities at Y-12 include waste management and environmental restoration.

2.2.2.1 *Waste Management*

The Waste Management Program activities at Y-12 are divided into five functional areas: (1) pollution prevention, (2) waste treatment, (3) waste storage, (4) waste disposal, and (5) continuity of operations and program support. The Y-12 waste management activities address all types of facility waste: radioactive, Polychlorinated Biphenyl (PCB), hazardous, mixed (both radioactive and hazardous), sanitary, and industrial. There are over 35 active waste management facilities at Y-12. These facilities are described in Section 4.11 and in Appendix A. Most waste management facilities at Y-12 are for waste storage and treatment. Three land disposal facilities are currently in operation at Y-12, and two more have been permitted and constructed. In addition to active waste management facilities, there are numerous inactive waste management facilities. Many of these are Solid Waste Management Units (SWMUs) managed under RCRA. Some former waste management units are now being addressed through response actions under CERCLA. Closed and inactive waste management facilities are not described individually in waste management sections of this SWEIS. A land disposal facility is currently being designed to accept waste generated as a result of response actions on the ORR. This planned facility, the Environmental Management Waste Management Facility, is described in Section 3.2.1 as a part of the No Action - Planning Basis Operations Alternative at Y-12.

2.2.2.2 *Environmental Restoration*

The lead agency for environmental restoration investigation and remedial activities on the ORR and Y-12 is DOE-ORO. EM oversees and manages ORR remedial activities pursuant to the *Federal Facilities Agreement for the Oak Ridge Reservation* (DOE/OR - 1014, January 1, 1992), serving as primary contact and coordinator with the regulators (the Tennessee Department of Environment and Conservation [TDEC] and the U.S. Environmental Protection Agency [EPA]) for implementing the Federal Facilities Agreement (FFA). There are several environmental restoration projects within the Y-12 area of analysis. These include the Bear Creek and Upper East Fork Poplar Creek (UEFPC) watershed projects which have been merged and is now called the Y-12 Project. The environmental restoration projects are not expected to change as a result of the alternatives analyzed in the SWEIS. Ongoing environmental restoration activities have been analyzed and it is not expected that environmental restoration activities or actions, which may be undertaken pursuant

to CERCLA, would change the alternatives considered in this SWEIS. In addition, the schedule for completion of activities would not change.

2.2.3 Nuclear Nonproliferation and National Security

The Nuclear Nonproliferation and National Security (NN) Program is responsible for the disposition of surplus fissile materials. NN is also responsible for implementing nuclear nonproliferation policy, bilateral nuclear treaties, and agreements with the International Atomic Energy Agency (IAEA). The National Security Program Office is responsible for supporting all NN nuclear and nonproliferation programs, verification activities, bilateral treaty support, and the interface role with the IAEA related to uranium. The HEU Disposition Project Office at Y-12 is responsible to NN for planning and technical support for surplus HEU disposition. In support of this mission, programs at Y-12 include Surplus HEU Management and Storage, and the Blending of Surplus HEU, including storage and handling of low enriched uranium and natural or depleted uranium blendstock.

2.2.4 Nuclear Energy, Science and Technology

Nuclear Energy, Science and Technology (NE) is responsible for maintaining the Nation's access to diverse energy sources as well as economic and technological competitiveness. Key activities include providing a power system for National Aeronautics and Space Administration space missions; serving the national need for a reliable supply of isotopes for medicine, industry and research; conducting research and development (R&D) associated with the long-term operations of current nuclear power plants; exploring advanced nuclear energy technologies; and ensuring the safe operations of reactors in DOE laboratories.

2.2.5 Nondefense Research and Development Program

ORNL uses some Y-12 facilities to house and support the laboratory's R&D activities. ORNL currently occupies 29 buildings and 2 trailers at Y-12 that contain a total of 128,360 m^2 (1,381,666 ft^2) of space. The facilities containing ORNL activities at Y-12 lie in the central and eastern portions of the Y-12 Site as shown in Figure 1.1.3–2. ORNL facility uses at Y-12 include Life Sciences, Physical Sciences, Technology Development, Technical Services, and Support Services. Other facilities are used for multiple purposes.

ORNL's activities were placed in available Y-12 facilities; consequently, activities in several functional categories are dispersed among a number of buildings (e.g., Technology Development is accommodated in 12 different buildings). ORNL is responsible for maintaining the buildings it uses at Y-12, but it has only limited responsibility for providing utilities and services that support ORNL activities.

The DOE Office of Science activities at Y-12 include the Field Research Center component for the DOE NABIR Program (DOE 2000b) being implemented at Y-12 as described in Section 3.2.2.6, the ORNL Mouse House, and Fusion Energy research activities.

The Engineering Technology Division has developed a unique capability in manufacturing technologies by integrating complementary resources within ORNL and Y-12. Within this complex, the ORNL R&D capabilities in materials and processes are meshed with the manufacturing, fabrication, and inspection skills of Y-12. This combination of R&D and manufacturing expertise has been combined with over 27,870 m^2 (300,000 ft^2) of manufacturing space and over 1,200 pieces of modern fabrication-related equipment to form the basis for the Oak Ridge Centers for Manufacturing Technology and the Y-12 National Prototyping Center, which is physically located within the east end of Y-12. The division has been the key integrator between Y-12 and ORNL. Capabilities include composites manufacturing technology, photonics, diagnostics, ultraprecision manufacturing, coatings, energy conservation, and environmentally conscious manufacturing.

2.2.6 Work-for-Others Program

The Work-for-Others Program is staffed with personnel working in computer science, mathematics, statistics, physical sciences, social sciences, life sciences, technology development and all engineering disciplines. The Work-for-Others Program's objectives are to make the ORR's R&D and prototyping capabilities available to both Federal agencies (such as U.S. DoD, National Aeronautics and Space Administration, etc.) and the private sector to:

- Solve complex problems of national importance
- Improve present capabilities for future DOE programs
- Transfer technology to industry to strengthen the U.S. industrial base

The Work-for-Others Program at ORR has been and is currently involved in advanced work in the environmental research, information management, materials, precision machining, hardware prototyping, and robotics technologies. These activities are carried out in various Y-12 facilities in conjunction with ongoing DOE DP activities.

2.2.7 Technology Transfer Program

The Technology Transfer Program is hosted by DOE and has as its goal to apply expertise, initially developed for highly specialized military purposes, to a wide range of manufacturing situations to support expansion of the capabilities of the U.S. industrial base. These activities are carried out in various Y-12 facilities in conjunction with ongoing DP activities.